MATERIALS BUREAU

TECHNICAL REPORT 89-3

AN EVALUATION OF SPIRAL RIB STEEL PIPE

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MARIO M. CUOMO, Governor
FRANKLIN E. WHITE, Commissioner

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ABSTRACT

This report contains the results of a laboratory evaluation of "UltraFlo" spiral rib steel pipe. The manufacturer, Contech Construction Products, Inc., had requested approval of "UltraFlo" for use on Department projects.

Based on laboratory results, it is recommended that test installations be constructed and monitored for possible pipe damage during installation and compaction.

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PURPOSE

The purpose of this evaluation was to use the standard parallel plate loading test, ASTM D2412, to compare a new pipe product, i.e. "UltraFlo", with a standard pipe, i.e. corrugated steel pipe. These tests do not represent buried pipe stresses since soil support is not present.

"UltraFlo" is constructed using a rectangular cross section rib that projects outward from the pipe (AASHTO M36, Type IR). This creates a relatively smooth interior wall in the pipe when compared to normal corrugated pipe, which Contech claims reduces roughness coefficients as much as fifty percent. Because of this reduction, a smaller diameter pipe can be used for a given flow, resulting in decreased construction costs.

TEST PROCEDURE

The laboratory evaluation consisted of testing "UltraFlo" under compressive load and measuring the deflections (5,10, and 20%) of the pipe. The compressive load was applied axially along the top and bottom of each two foot sample of pipe. The test was repeated using a normal corrugated steel pipe of equal gauge and diameter.

A total of eight samples were tested: two twenty-four inch diameter, sixteen gauge "UltraFlo", two twenty-four inch diameter, sixteen gauge corrugated steel pipe with 2 2/3x1/2 inch corrugations, two thirty six inch diamter, sixteen gauge "UltraFlo", two thiry-six inch diameter, sixteen gauge corrugated steel pipe with 2 2/3x1/2 inch corrugations.

It should be noted that the steel used in the pipe was aluminum coated rather than the more common zinc coating. Aluminum coating will neither increase or decrease the pipe's structural strength.

RESULTS AND DISCUSSION

In examining the results (see following page), the twenty-four inch diameter "UltraFlo" is stronger at 5% deflection than the the twenty-four inch diameter corrugated pipe, while being virtually identical in strength at 10 and 20% defections.

The thirty-six inch diameter "UltraFlo" and corrugated pipe are basically equal in strength at all deflections.

It is important to note that after a test pipe reached approximately 20% deflection under load, its shape deformed axially due to lockseam strength and lack of uniform restraint. Beyond this amount of deflection, values are invalid.

CONCLUSIONS

Relative pipe strengths are virtually identical, which shows that the spiral rib pipe is equal in strength to normal corrugated pipe. However, corrugated pipe can be fabricated with larger corrugations (3x1 and 5x1 inch), which increase the pipe's strength. This could result in significant strength differences in larger diameter pipe (+72 inch) when larger corrugations are used. The "UltraFlo" rib is the the same cross section (3/4 inch) and spacing at all diameters.

Test results beyond 20% deflection are not accurate due to non-uniform deflection and buckling caused by heavier thicknesses of steel at the lockseam.

Based on laboratory results, it is recommended that test installations be constructed and monitored for possible damage during placement and backfilling. The height of cover design chart from Contech should be reviewed and approved by the Department's Soils Mechanics Bureau.

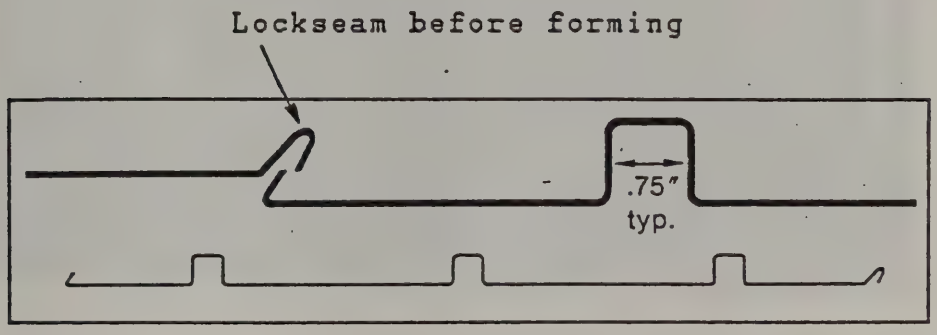
TEST RESULTS

PIPE STIFFNESS, PSI

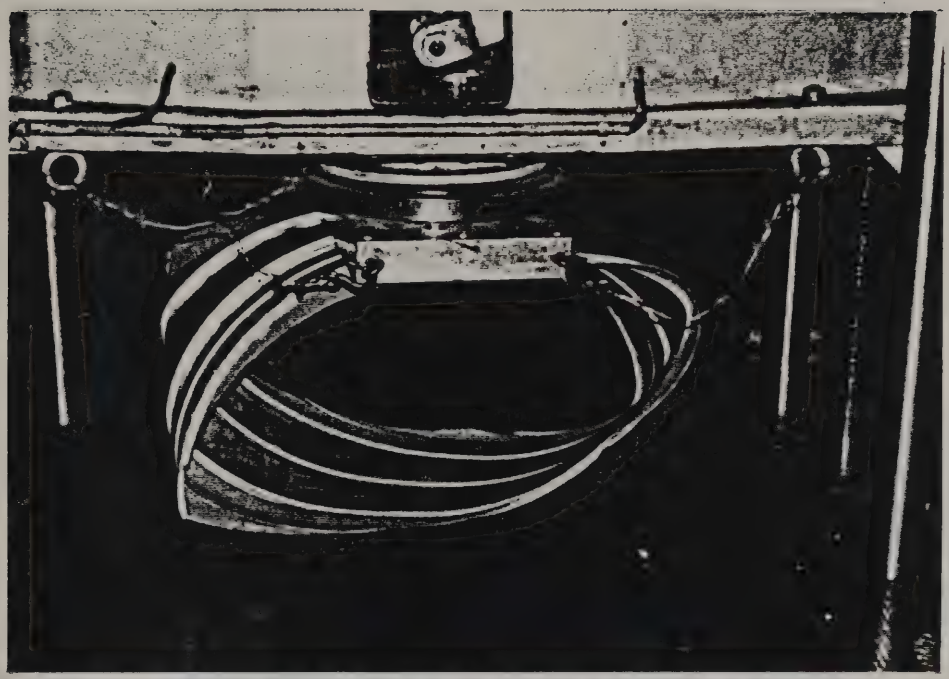
	24" DIA ULTRAFLOW		24" DIA CORRUGATED	
DEFLECTION	SAMPLE #1	SAMPLE #2	SAMPLE #1	SAMPLE #2
5%	67	62	60	60
10%	39	41	40	39
20%	21	22	20	20

	36" DIA ULTRAFLOW		36" DIA CORRUGATED	
DEFLECTION	SAMPLE #1	SAMPLE #2	SAMPLE #1	SAMPLE #2
5%	24	26	25	22
10%	17	17	17	14
20%	9	9	9	7

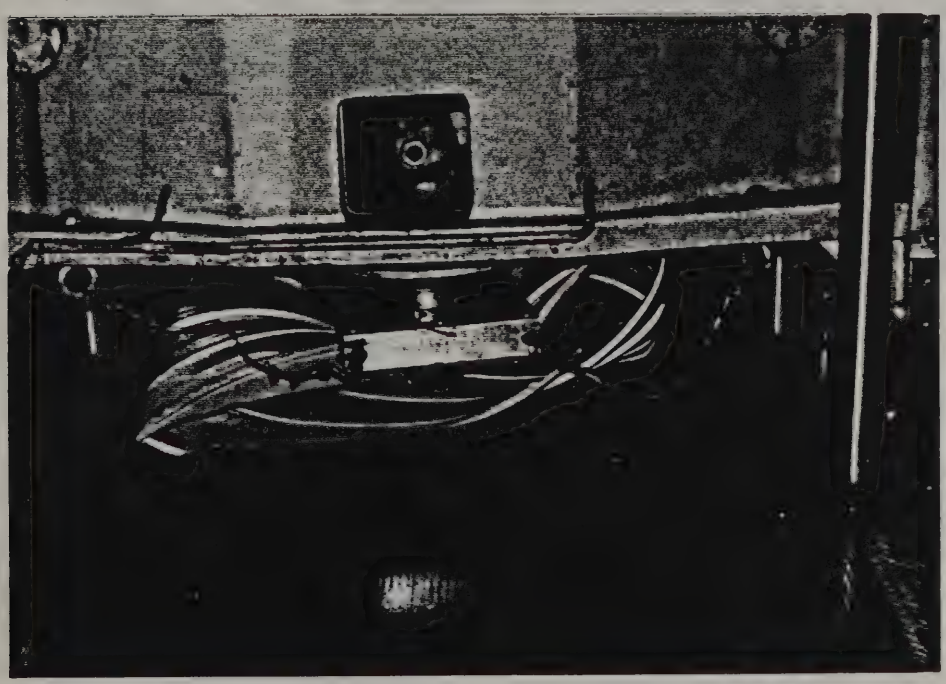
CROSS-SECTIONAL VIEW OF A SPIRAL RIB

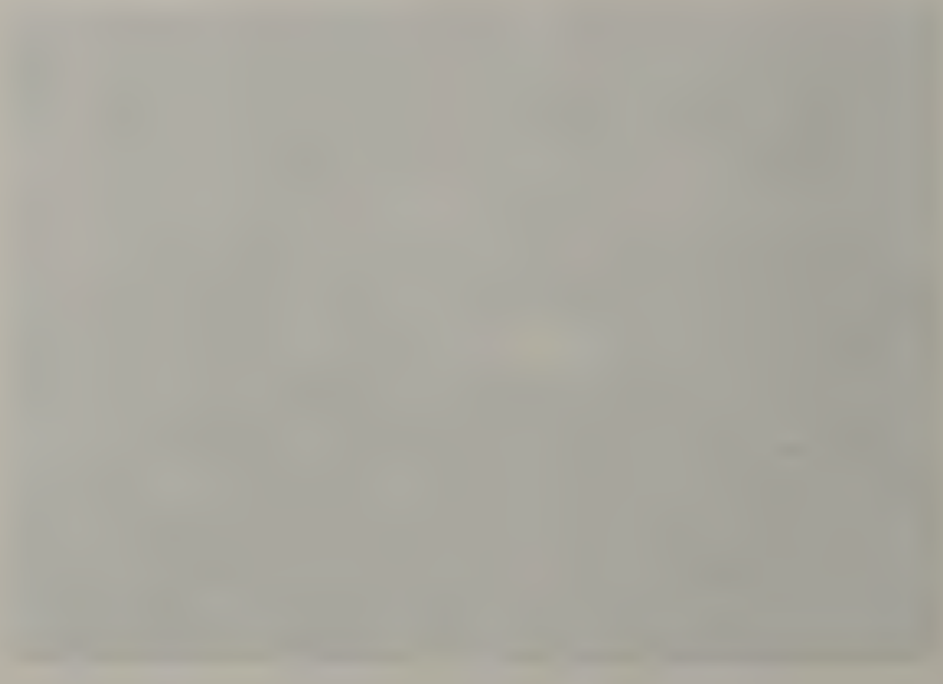


Distance between ribs (center to center)
approximately 7.50 inches

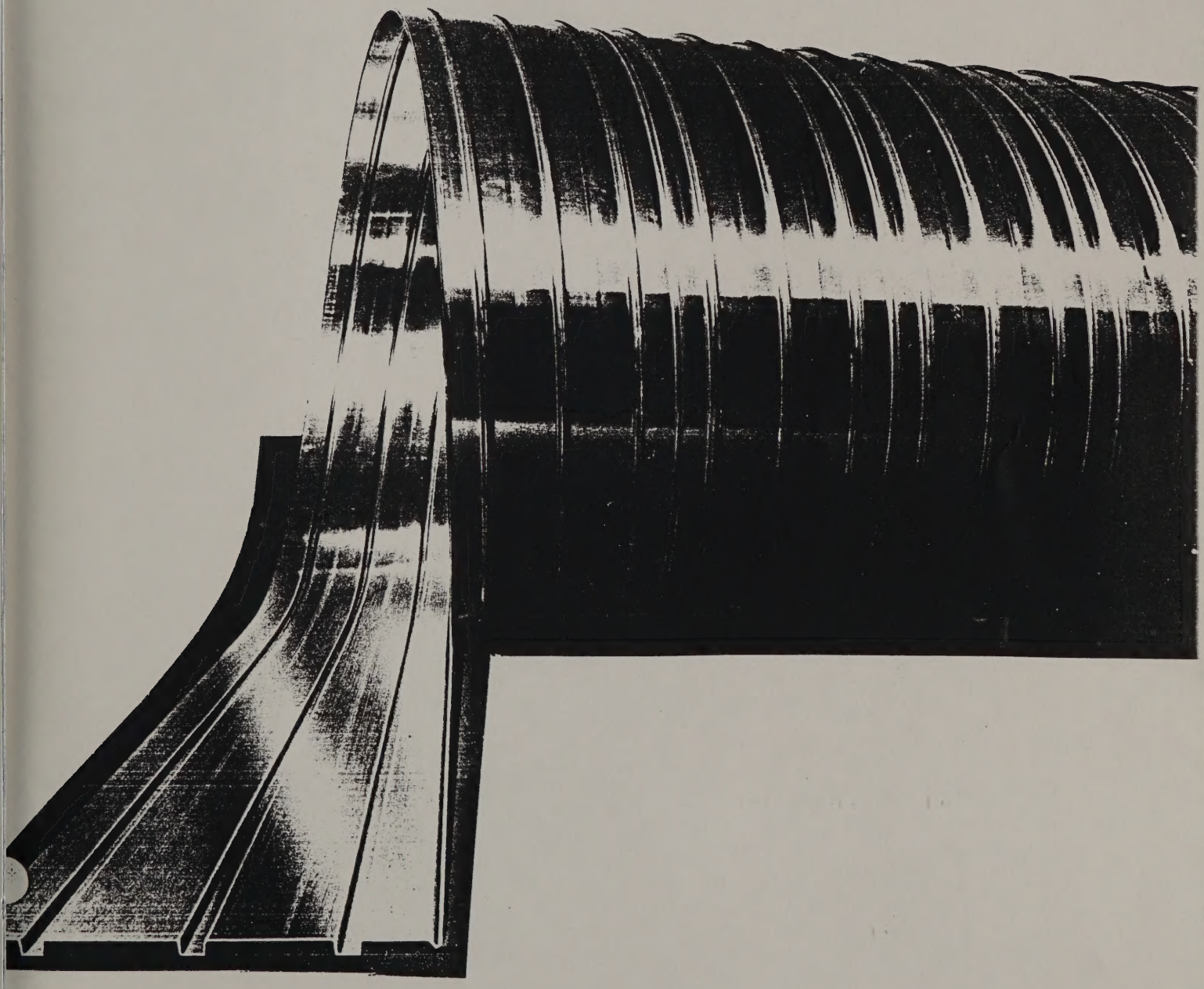


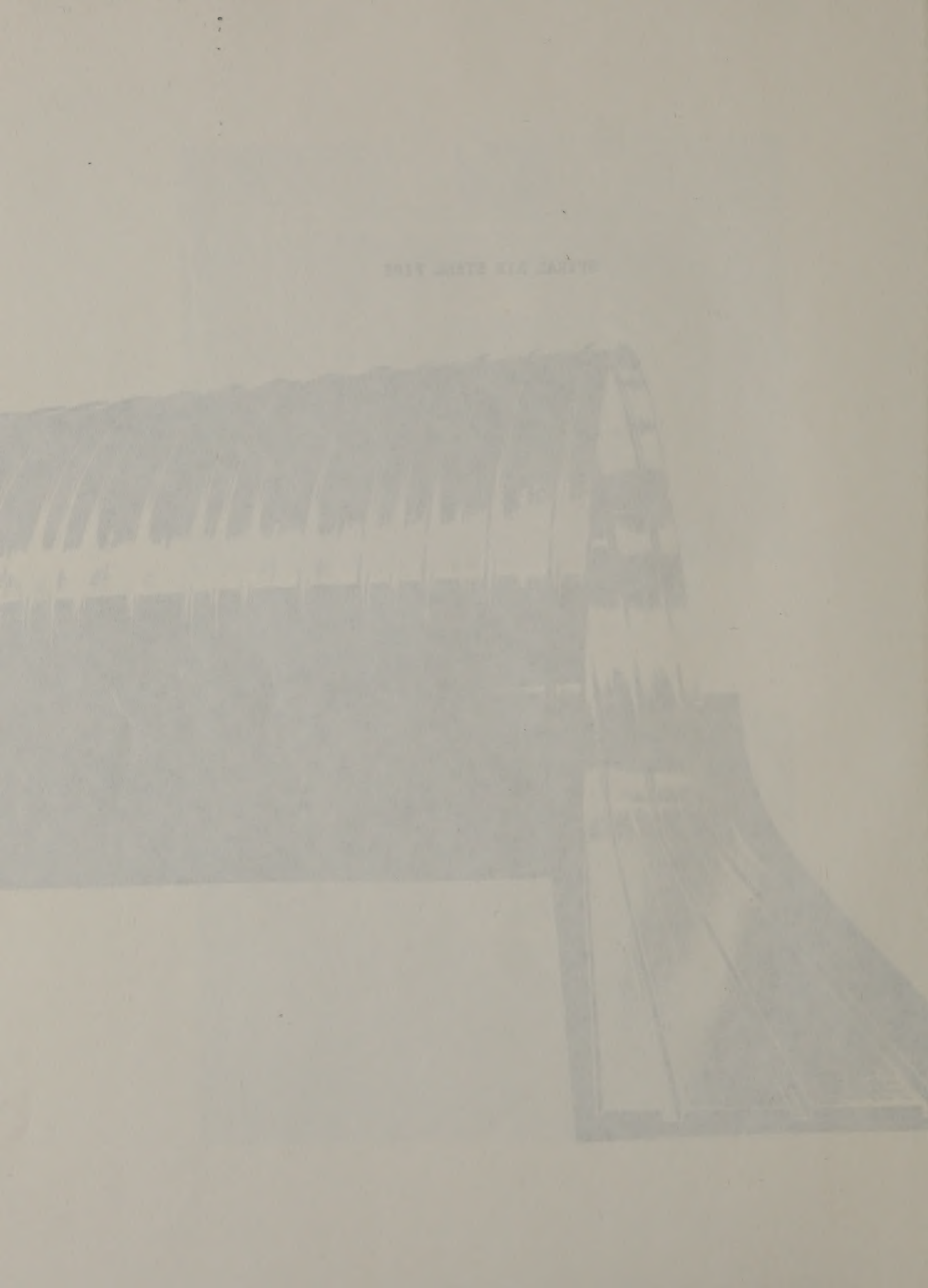
Axial Deformation of Steel Spiral Rib
Pipe During Parallel Pipe Loading





SPIRAL RIB STEEL PIPE





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